Los Alamos software discovers new world-record lightning flashes

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Using Los Alamos software developed by Michael Peterson, of the Laboratory's Space and Remote Sensing group, two lightning “megaflashes” were discovered and deemed world records—one for flash distance and the other for flash duration—by the World Meteorological Organization.

Not all lightning strikes down from a cloud to the ground. In fact, most lightning flashes occur within a thundercloud, extending horizontally across a storm. Under the right conditions, these horizontal cloud flashes can spread over exceptional distances.

The world record for flash distance went to a single horizontal megaflash that occurred over southern Brazil on Oct. 31, 2018. The flash spanned 709 km (440 miles), more than doubling the previous record of 321 km (199 mi). Rather than propagating in one direction from one end to the other, the flash started centrally and extended simultaneously in two directions, northwest and southeast. The flash was finished in 11.3 seconds—easily missed by the population below but forever recorded by space technology.

The other world record was set for a lightning flash duration. It occurred over northern Argentina on March 4, 2019. Although smaller than the Brazil flash, the Argentina flash lasted for over 16.7 seconds, more than twice the duration of the previous record of 7.74 seconds.

“These megaflashes represent atmospheric extremes, which are essential to monitoring climate change as well as safety for both humans on Earth and satellites in space,” Peterson said.

Data analysis after the fact

Although these megaflashes occurred in 2018 and 2019, the full details of their distance and duration weren’t understood until more recently. It took a new type of software and data analysis to fully elucidate the findings.

Peterson developed an analysis technique to repair data recorded by Geostationary Lightning Mapper (GLM) satellites. The GLMs deal with a huge amount of data, and as such, they defer to algorithms that gate recordings to three seconds, artificially splitting megaflashes into several smaller flashes. Peterson's technique corrects this false splitting.

For the world record, Peterson reprocessed operational GLM data hosted by the National Oceanic and Atmospheric Association at their Comprehensive Large Array-data Stewardship System (CLASS).

With this new analysis technique and modern satellite technology, more discoveries are sure to follow, including national security-relevant discoveries.